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Systematics of *Pseudomethoca areta* (Cameron): Sex association, description of the male and a gynandromorph, and a new synonymy (Hymenoptera: Mutillidae).

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Abstract.—A gynandromorph of *Pseudomethoca areta* (Cameron, 1895) is described, and previously published cases of gynandromorphism in Mutillidae are reviewed. Sex association permits recognition of the undescribed male of *P. areta*. We place *Pseudomethoca panamensis* (Cameron, 1895) in New Synonymy with *P. areta*.

Resumen.—Se describe un individuo ginandromorfo de *Pseudomethoca areta* (Cameron, 1895) y se presenta un resumen de casos previamente descritos de ginandromorfia en Mutillidae. Se lleva a cabo la asociación sexual y se describe al macho de *P. areta*, hasta ahora desconocido. *Pseudomethoca panamensis* (Cameron, 1895) se coloca como Nueva Sinonimia de *P. areta*.

INTRODUCTION

Mutillids are solitary parasitoid wasps that exhibit great sexual dimorphism, making sex associations difficult. The New World genus *Pseudomethoca* Ashmead illustrates this problem; only one-fifth of its 103 described species are known from both sexes. Distinctly fewer sex associations have been obtained for Neotropical than for Nearctic species of *Pseudomethoca*. Seventeen out of 45 Nearctic species known (37.8%) have both sexes recognized (Krombein, 1992). Of the remaining 28 species, 20 are known only from females, and eight only from males. In contrast, only four of some 58 Neotropical species of *Pseudomethoca* are known from both sexes (6.9%) (Nonveiller, 1990; Cambra & Quintero, 1992). Of the remaining 54, 46 are known from females only, and eight from males only. Success in associating the sexes will facilitate future biological work on the group and will solve some of the annoying taxonomic problems. We suspect that only about one-third of the species of *Pseudomethoca* in the Neotropics have been described. Previous taxonomic work on *Pseudomethoca* was done by Mickel (1924, 1935, revision of North American species; 1952, key to females of Guyanan species), Schuster (1945, key to Caribbean species), and Krombein (1992).

Gynandromorphy is a developmental phenomenon useful for associating the sexes in some extremely dimorphic animals, including mutillids (Mickel 1928, 1936, 1952; Bischoff 1931). Unfortunately, gynandromorphs are rare in Mutillidae. After examining more than 15,000 mutillid specimens, we have discovered only two gynandromorphs. A review of the literature revealed only six previously published cases (Table 1). We report here the second known Neotropical mutillid gynandromorph. We recently discovered a gynandromorph of *Timulla labdace* Mickel, from Panama, that will be described in a separate publication.

Pseudomethoca areta (Cameron)
Figs. 1 - 4

Sphaerophthalma areta Cameron, 1895: 332, pl. 14, fig. 12, female. Bugaba, Chiriqui Province, Panama, Champion col., BM(NH), London, Type 15.822, examined; *Pseudomethoca areta*: Cambra & Quintero, 1992: 474.

Sphaerophthalma panamensis Cameron, 1895: 334-35, female. Bugaba, Chiriqui Province, Panama, Champion col., BM(NH), London, Type 15.833, examined; *Pseudomethoca panamensis*: Cambra & Quintero, 1992: 475. NEW SYNONYMY.

Diagnosis.—In Mickel's revised key (1935) it runs to *P. vanduzei* Bradley in couplet five. The male of *P. areta* differs from *P. vanduzei* as follows: posterior half of tegula bent downward so as to form a posterior face at a sharp angle with the dorsal surface (in *P. vanduzei* the tegula is uniformly convex, without a posterior face); anterior margin of clypeus in *P. areta* is bidentate (it lacks teeth in *P. vanduzei*); mandibles tridentate at the tip in *P. areta* (bidentate in *P. vanduzei*); integument of abdomen mostly ferruginous in *P. areta* (totally black in *P. vanduzei*). *Pseudomethoca areta* is endemic to Panama, and *P. vanduzei* is present in the southeastern United States (Krombein, 1979).

Description.—Integument black, except apex of tergum one and abdominal segments two to six, orange. Head large, subrectangular in dorsal view, as wide as thorax, clothed with long, erect and recumbent white pubescence; row of six to eight long, erect, dark hairs near inner margin of eyes; posterolateral angles of head not dentate. Mandibles tridentate distally; clypeus strongly bidentate medially on the cephalic margin; disk of clypeus densely punctate. Scape with a strong longitudinal carina beneath; first flagellomere equal in length to second. Front, vertex and genae coarsely and confluently punctate. Antennal scrobes and genae not carinate. Ocelli small, distance between eye margin and lateral ocelli equal to approximately five times the greatest diameter of the latter.

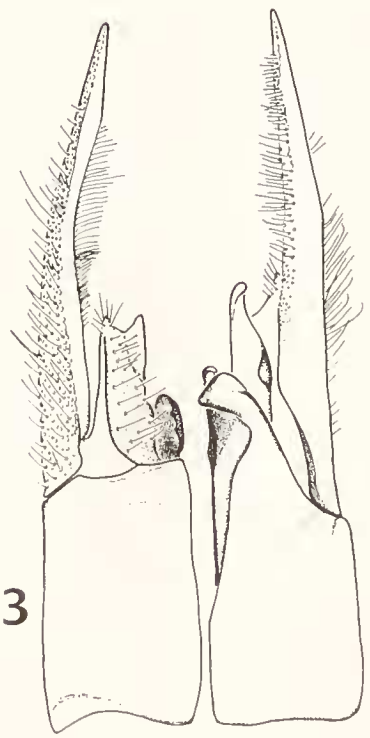
Pronotum, mesonotum and scutellum with close, more or less confluent punctures, punctures about the size of those on head. Propodeum strongly and coarsely reticulate dorsally and posteriorly. Tegula punctate throughout; posterior part of tegula bent downward so as to form a posterior face at a sharp angle with the dorsal surface. Humeral angles of pronotum without any evidence of a carina. Propleura and mesopleura with close punctures; metapleura smooth, without punctures; sides of propodeum with only a few scattered punctures. Pronotum, scutellum, metanotum and dorsal face of propodeum, clothed with sparse, long erect white pubescence; mesonotum clothed with sparse black pubescence; tegula clothed with intermixed, black and white pubescence; metapleura and sides of propodeum almost bare, with only sparse white micropubescence.

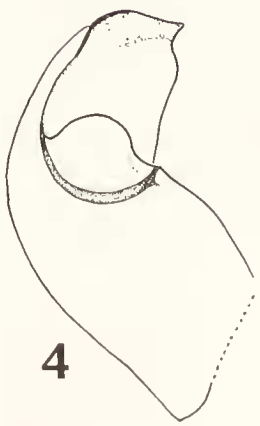
Anterior and intermediate coxae without teeth or keels; posterior coxa with a keel on inner margin. Legs clothed with sparse white pubescence. Calcaria pale.

Abdomen with segment one completely sessile with second. Terga one and two with small, separated punctures, except the apical margins with close punctures; terga three to six with small, close punctures. Pygidium rugose. Felt line 0.6 x as long as lateral margin of tergum two. Sternum one almost smooth, with only a few, sparse punctures, and with a low, median longitudinal carina on anterior two-fifths. Sternum two with sparse, moderate punctures. Sterna three to six with close, moderate punctures. Posterior margin of hypopygium evenly convex. Tergum one clothed with sparse, long erect, white pubescence. Terga two to six with sparse long erect, orange pubescence, the apical margins with a band of dense, recumbent, orange pubescence. Last tergum clothed with black pubescence. Sterna one to six clothed with white pubescence, except lateral margins of sterna two to four, with orange pubescence. Last sternum clothed with white pubescence and a few intermixed fuscous hairs. Wings infuscated, especially apically; forewing with two well defined submarginal cells and traces of a third. Body length: 10.6 mm.

ALLOTYPE Male Information.—PANAMA: Darién Province, Cruce de Mono, Estación INRENARE, 8 Feb 1993 (yellow trap). R. Cambra T., J. Coronado, Museo de Invertebrados "G. B. Fairchild", Universidad de Panamá (MIUP).

Additional Material Examined.—PANAMA: Darién Province, Cruce de Mono, Estación INRENARE, R. Cambra, J. Coronado, 144 females and 27 males, 8 Feb – 4 Mar 1993, deposited in MIUP, NMNH-Smithsonian Institution, University of Minnesota Insect Collection, and BM(NH). Body length varies in males from 8.3 to 11.0 mm, in





Figs. 1-4. *Pseudomethoca areta*. 1. Male allotype, dorsal habitus. 2. Gynandromorph, dorsal habitus. 3. Male genitalia, split drawing, dorsal = right; ventral = left. 4. Penis valve, side view.

females from 7.8 to 11.1 mm.

Comments on Sex Association and New Synonymy.—Sex association is based on observations of males courting and mating with females in the field, and has been corroborated in the laboratory with mating experiments. Courtship is very brief, lasting 15-40 seconds, and consists of bursts of rapid vibrations of the wings and antennae, interspersed by short hopping flights. The male climbs onto the female and grasps her neck with his mandibles and attempts to mate with her. We have not seen heterospecific courtship or mating in *Pseudomethoca*. Erroneous heterospecific sex associations may be made if containers or outdoor sites become contaminated by pheromones released from a female of a different species that recently occupied that site (personal observations).

Males of *Pseudomethoca areta*, like those of the genotype and males of numerous other species of *Pseudomethoca* we have examined, have a strong longitudinal carina beneath the scape. Therefore, we consider erroneous Casal's (1965) observation that males of the ill-defined genus *Darditilla* Casal (genotype is only male known, and 35 other species, known only from females) differ from those of *Pseudomethoca* in having a carina beneath the scape, said to be absent in the latter. The male genitalia of *P. areta* are symmetrical (Fig. 3), as are those of all other Neotropical sphaeropthalmine males we have examined, and phoretic mating is absent in this group. In contrast, the Neotropical mutilline males of *Timulla (Timulla)* present strongly asymmetrical genitalia and phoretic matings (Cambra & Quintero, 1992). The asymmetry in the male genitalia possibly functions to provide a better hold, or grasp, of the female while airborne.

Cameron's types of *areta* and *panamensis* are both from Bugaba, and we found them to be identical; the name *areta* has page precedence over that of *panamensis*. *Pseudomethoca areta* is closely related to *P. hecate* (Gerstaecker, 1874), from Costa Rica, differing only in the integumental coloration of the vertex and dorsolateral areas of the thorax. We suspect that they are the same species. To confirm the synonymy we need to examine Gerstaecker's type specimen and to compare the genitalia of males sexually associated with *hecate* females with those of the males described here.

Gynandromorph Individual of *Pseudomethoca areta*
Fig. 2

Description.—Head identical to that of a normal female, without a trace of male characters. Thorax and legs identical to those of a normal male, without a recognizable trace of female characters. The anterior wings have abnormally thin, translucent venation; they are torn along their posterior half, and we suspect were never functional. Abdomen with six segments, as in the female. First tergum completely male. Second tergum a mosaic: right half with coloration and pubescence of male and female; left half is completely male-like. Third tergum, right half with female characteristics only; left half is a mosaic with integument coloration and pubescence both of male and female. Abdominal segments four to six are female only. Second sternum with right half female and left half male, same as other sterna, except for sternum three, identical to that of a female. Body length: 11.1 mm.

Data and comments on the gynandromorph.—The gynandromorph individual was collected on 26 February 1993, at 10:00 AM, in the general locality of the allotype. When we first noticed it, the individual was walking over dry leaves on the ground. Shortly afterward, we watched a male arrive, flying upwind, attracted by what we thought was a normal female. The male quickly attempted to mate but encountered indifference on the part of the female-like individual. Female mutillids are known to attract winged males by means of wind-dispersed pheromones (see Cambra & Quintero, 1993). The upwind arrival of the male suggests that the gynandromorph individual was secreting female pheromones. The abnormally thin and quite battered forewings, suggest that the animal was unable to fly, although it had perhaps attempted to. The specimen exhibits anterior/posterior division of male and female components, as well as mosaic segments, a type of gynandromorphy not previously described for mutillids (see Table 1).

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Table 1. Previously published cases of gynandromorphy in Mutillidae

Species	Type	Wing & tegula	Country	Ref.
Mutilla europea obscura	bilateral, right f, left m	+	Finland	Maeklin 1856 DallaTorre & Friese 1899
Dasymutilla cypris [=hora]	head, thorax. abdom. segm. 5-7 m; 1-4 f	+	USA	Mickel 1928
Dasymutilla gloriosa [=reperticia]	not described	?	USA	Mickel 1936
Dasymutilla vestita [=euchroa =fulvohirta]	decussated, head half: right m, left f; thorax & abdomen: right f; left m	0	USA	Mann 1915
Pseudomethoca frigida [=canadensis]	bilateral, right m, left f	+	USA	Wheeler 1910
Traumatomutilla dubia	head, thorax, 1st abdom. segment m, rest abdomen mosaic	+	Am. Mer. [Guyana]	Bischoff 1931 Mickel 1952

Abbreviations: f, female; m, male; +, well developed; 0, absent.